

Aquatic Invasive Species

I. What is an invasive species?

- An **invasive species** is a species of plant, animal, microbe, or any other organism that has been transported by humans from its natural habitat to a new area that it would not be able to get to on their own, through natural dispersal. Invasive species also cause negative impacts on their new ecosystems – which can include environmental or economic damage, or harm to human health*. An **aquatic invasive species** is simply an invasive species that lives in water.

There are a couple other terms that people may use when discussing whether or not a species is invasive, or when comparing invasive species to other organisms. An invasive species is NOT:

- A **native species**, or a species that is naturally occurring in an area. All species evolve and may be moved around over time, but when we talk about native species, we mean species that have existed in an area for thousands of years, or before humans settled in the area. In the United States, native species are usually considered those that existed before Europeans arrived in the 1700s.
- An **exotic** or **non-native species**, which is not naturally occurring in an area but does not cause widespread negative impacts. Not all non-native species are invasive.

* It is important to understand that the definition of an invasive species is not completely clear cut. Some invasive species may cause some negative impacts, but also some positive impacts. What is considered “harm” to the environment or human communities may not always be agreed on by all scientists or community members.

II. Distribution: How did they get here?

Invasive species may be introduced to a new area either accidentally or intentionally by humans. It's important to understand how invasive species get to a new area, so we can try to prevent it from spreading in similar ways, or prevent other similar organisms from being transported. Here are some common ways that aquatic invasive species get moved to their new habitats:

Local Invasive Species:

Zebra Mussel

Distribution

Zebra mussels were found in the Great Lakes in 1988, and were likely brought here in transoceanic ships.

Impact

Zebra mussels are filter feeders, and can significantly increase water clarity. This changes the types of plants that can grow in a lake, which then supports different kinds of fish and other organisms.



Zebra mussels also attach aggressively to any hard surface, and can clog water intake pipes in lakes, and cling onto boats and fishing nets.



They are also D-shaped, rather than more oval like the native clams. They can be very sharp, and cause swimmers a lot of pain and annoyance in many places where they have taken over entire beaches!



Photo: www.invasive.org

- Ballast water release**
 64% of aquatic invasive species in the Great Lakes have been transported from Europe, Asia, or Russia in the ballast water of cargo ships, or the water that ships take up or release for keeping the ship at the proper depth in the water for optimal balance. Many small freshwater organisms, such as **Zebra or Quagga Mussels**, can be accidentally transported across oceans in this way.
- Accidental transport or release**
 Many invasive species can be accidentally released by public water users. **Non-native bait fish** may accidentally fall off a hook and begin growing in a new lake. Small pieces of invasive plants, such as **Hydrilla**, may get accidentally stuck on someone's boat or shoes, and get released into a new body of water if not cleaned off.
- Increasing connections between water bodies (locks, canals, channels)**
 Humans have been increasingly connecting bodies of water with locks, canals and channels, usually to allow trading ships to move further. However, this also allows invasive species to spread more easily. The **Asian Carp** is now threatening to enter Lake Michigan from the Mississippi River through the man-made Chicago Sanitary and Ship Canal.
- Aquarium trade and dumping**
 Some invasive species may be shipped far distances to be sold as aquarium fish or decorations. When aquarium plants or fish are no longer wanted, some owners dump them down the drain, or even directly into a nearby body of water, which can allow the species to start growing and spreading rapidly. This is how **Hydrilla** got transported to North America from Japan.
- Intentional release: fish stocked for sport fishing**
Northern Pike and **White Perch**, for example, were illegally but intentionally introduced to the Great Lakes by fishermen who wanted to fish for these species. These fishermen might not consider these fish to be harmful, but many scientists do, because they have caused other native species of fish to decline.

Local Invasive Species:

Hydrilla



Distribution

Hydrilla is originally from Southeast Asia, and was transported to North America in the aquarium trade. In August 2011, Hydrilla was first found in Cascadilla Creek and the Cayuga Lake Inlet, likely transported by boaters.

Impact

Hydrilla is an extremely fast-growing plant, and can take over entire areas once it has invaded. Hydrilla can grow into thick mats up to 25 feet thick, which can use up resources needed by many other species.



Thick mats of Hydrilla can also cause problems for boaters, swimmers, and fishermen.



Photo: www.invasive.org

Sea Lamprey

Distribution

Sea Lamprey are native to the Atlantic coast of North America, but were first found in the Great Lakes in 1835.

Impact

Sea Lamprey are *parasites*, which means they feed on and harm another organism – in this case, large fish such as lake trout. In its lifetime, one lamprey can kill up to 40 lbs of fish!



Control

Low walls such as this one are used to stop lamprey as they migrate upstream to spawn. Fish that we do not want to affect, such as trout, are able to jump over these low walls.



III. Invasive Species Characteristics: What makes a species invasive?

Not all organisms that get transported to new environments become invasive. Some species may not survive or grow quickly, spread very far, or cause very negative impacts – these are **exotic** rather than invasive species. Knowing the characteristics that allow invasive species to become invasive helps scientists predict which exotic species may become invasive, and where to spend more time and money studying and controlling these species.

Invasive species tend to:

- be **naturally fast-growing and aggressive**, which allows them to spread quickly and take over an area, as well as use resources more effectively than native species
- **tolerant of a range of environmental conditions**, which allows them to adapt well to new environments, even if the resources available (light, oxygen, space, food, etc.) are not what they prefer, OR have **similar environmental conditions in their native range** so they are already well adapted to growing in their new environments
- **lack predators and competitors** that normally control their explosive growth in their natural habitats

IV. Ecological and Human Impact: What are some of the problems that invasives cause?

There are over **185 invasive species** in the Great Lakes alone. With so many different species, there are many, many different ways these species can cause negative impacts. Here are some categories of common impacts invasive species can have:

Ecological Impact

- **Disrupt the interconnectedness of the ecosystem**, such as the balanced food web. An invasive species may be a top predator, or may be a small zooplankton that increases resources to certain species at the bottom of the food chain.
- **Use up resources or changes the availability of resources** that native species need, causing natives to decline or become extinct

Ultimately, the outcome of these environmental changes is the change in the composition of the ecosystem, usually involving the loss of native species and general loss of biodiversity.

Impact on Human Communities

- **Economic cost** of controlling invasive species and **economic losses** due to property damage and other monetary losses
The Great Lakes Commission estimates that invasive species cost the region **\$5.7 BILLION annually**. **Zebra mussels** alone cost **over \$1 billion** to deal with each year, as they must be removed from the intake pipes of water treatment plants. **Sea lamprey** can cause up to \$20 million in losses annually due to the large trout they consume.
- **Potential human health threats**
Zebra mussels, for example, may concentrate toxic chemicals in their tissues. If they, or any of their predators, are eaten by humans, these toxins can be consumed.
- **Inconvenience / annoyance**
Widespread invasive species such as **Zebra mussels**, **Hydrilla**, **Water Chestnut**, and **Purple Loosestrife** can cause problems for boaters, swimmers and fishermen by getting caught in fishing nets and on boat motors, and decreasing overall water quality.

V. Control: What can we do?

Once invasive species are identified, many different methods can be used to try to get rid of them, or at least control their spread and negative impact.

Active Control

- **Add chemicals** that may kill the invasive species, such as herbicides to kill aquatic plants, and lampricide to kill sea lamprey. However, these chemicals may kill other non-invasive organisms as well.
- **Physically remove** the invasive species. Walls and other electric barriers have been put up to prevent some invasive species, such as the **Asian Carp**, from crossing into a new area. Water companies use scrapers or higher water velocity to physically remove **Zebra or quagga mussels** from their water pipes. Sometimes, cities ask for volunteers to help remove water aquatic plants, such as **water chestnut**, from an area.

Some of these control methods, such as the use of chemicals, have other negative side effects. The best way to reduce the impact of invasive species is **preventing them from becoming invasive in the first place**. For example, **laws** are being put in place to regulate the release of ballast water. Members of the public can also play important roles in preventing the spread of invasive species. Here are some ways you can help:

Prevention

- Make sure you **thoroughly wash, dry, and inspect** your boat (and anything else that entered the water) after leaving a lake for any invasive species that may have accidentally become attached.
- **Do not dump aquarium species** down the drain or into a body of water. Bring your organisms back to your aquarium store for instructions about what to do with different species.

- **Learn to identify** invasive species, so you can report sightings of invasives to your local authorities. This helps scientists track where invasive species are spreading, so they know where to go to control them.

Additional Resources

For Teachers:

- New York Invasive Species Clearinghouse: <http://www.nyis.info/index.php>
-provides detailed information and the latest news about local invasive species
- Great Lakes Information Network:
<http://www.great-lakes.net/envt/flora-fauna/invasive/invasive.html>
-provides detailed information and links to additional resources for individual species in the Great Lakes region
- Mississippi State University Extension: <http://msucares.com/pubs/publications/p2286.pdf>
-contains a variety of suggested classroom activities focused around invasive species

For Students:

- Nab the Aquatic Invader: http://www.iisgcp.org/NabInvader/great_lakes.html
-web-based animated game for younger students to explore local aquatic invasive species and concepts. This website also includes links to additional resources.